

## EXPLANATION OF PLATE 39.

Fig. 1. Skull of *Biziura lobata*, side view.

*l.*=lachrymal. *mx.*=maxilla. *n.*=nasal. *pa.*=palatine. *p.o.p.*=  
postorbital process. *t.f.*=temporal fossa. *q.*=quadrate. *v.*=vomer.

Fig. 2. Pelvis of *Biziura lobata*, dorsal aspect.

*a.*=acetabulum. *il.*=ilium. *is.*=ischium. *p.*=pre-acetabular  
ilium. *pb.*=pubis. *s.s.*=synsacral crest.

Fig. 3. Portion of right leg of *Biziura lobata*, outer aspect.

*f.*=femur. *fb.*=fibula. *pt.*=patella. *t.*=tibia.

## On the Membranous Labyrinths of certain Sharks.

By CHARLES STEWART, F.R.S., F.L.S.

[Read 16th November, 1905.]

(PLATE 40.)

THE admirable monograph on the organs of hearing of the Vertebrata by Prof. Retzius\* leaves little or nothing that one would wish to add to the account of the forms therein treated; but having had the opportunity of examining some not dealt with in that work, it seems desirable to give some record of their structure.

One cannot but recognize that features apparently most trivial may prove useful in helping to show the real affinities of an organism, and occasionally the solution of the more difficult question of the function of a structure may be suggested, when such a structure is found to be possessed by forms dwelling in a like environment that by other features have had their affinities differently interpreted.

## NOTIDANUS GRISEUS. Fam. Notidanidæ.

In this Shark the utricle presents the ordinary elasmobranch features as figured by Retzius and others, being divided into two portions not directly communicating with one another and with their walls completely separate. In spite of the fact that Retzius reserves the name utricle for the anterior of these, and calls the other posterior canal, I propose speaking of them here as utriculus anterior and utriculus posterior; for a comparison with the utricle of *e. g.* *Teleostea* leaves no doubt that they are portions of that chamber (*l. c.* p. 218).

The anterior utricle has no direct opening into the saccule, but communicates with it indirectly through the recessus utriculi.

\* 'Das Gehörorgan der Wirbelthiere,' Bd. i. (1881).

A large aperture (ductus utriculi) in the floor of the utricle opens into the recessus, and from the postero-superior parts of the recessus a tube-like passage (canalis recessu saccularis) leads into the saccule.

As the skin was required for other purposes, the nature of the superficial portion of the ductus endolymphaticus and its opening could not be determined.

LÆMARGUS BOREALIS. Fam. Spinacidæ.

In this species the labyrinth has a considerable resemblance to that of *Notidanus*.

The ductus endolymphaticus, after passing through the cartilaginous roof of the skull, takes the usual forward course, but more directly upwards than in most cases; at the extremity of this portion it ascends nearly vertically to its cutaneous opening. The recessu-sacculine and posterior utriculo-sacculine canals are much wider than in *Notidanus*. The sacculus is small, with the lagena cochliæ as a large depression of its postero-inferior angle. The dorsal extremities of both portions of the utricle are more dilated than in *Notidanus*.

LAMNA CORNUBICA. Fam. Lamnidæ.

On examining this form, one is at once struck by the apparent fusion of portions of the two divisions of the utricle, forming a structure that has a close superficial resemblance to the sinus superioris utriculi of the Teleosts; their cavities, however, remain distinct.

In front and parallel to this may be seen the ductus endolymphaticus passing upwards to penetrate the skull; it then passes forwards in close contact with the skull for about 18 mm., and bends for a short distance backwards before ascending nearly vertically to its external opening. The sacculus is small and cylindrical, terminating in a lagena cochliæ wider than itself. The recessus utriculi opens into the utricle above and the sacculus behind by a common orifice. At the same point the ductus endolymphaticus arises. Two small ramuli neglecti pass to the macula neglecta on the outer side of the posterior utriculo-sacculine canal.

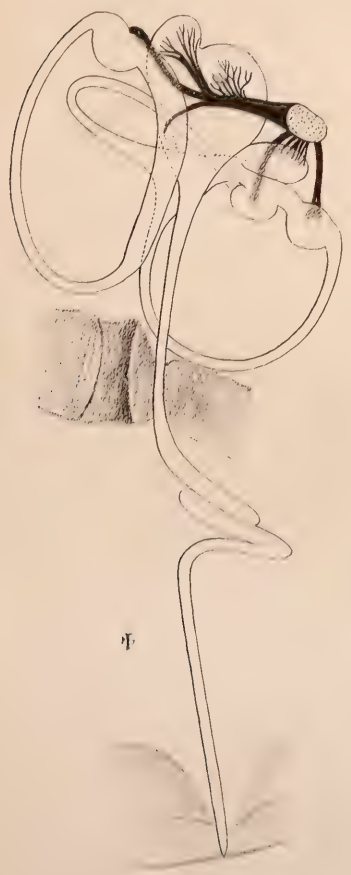
ALOPECIAS VULPES. Fam. Lamnidæ.

In this Shark the ductus endolymphaticus lies in a similar position to that in *Lamna*, well anterior to the blended portions

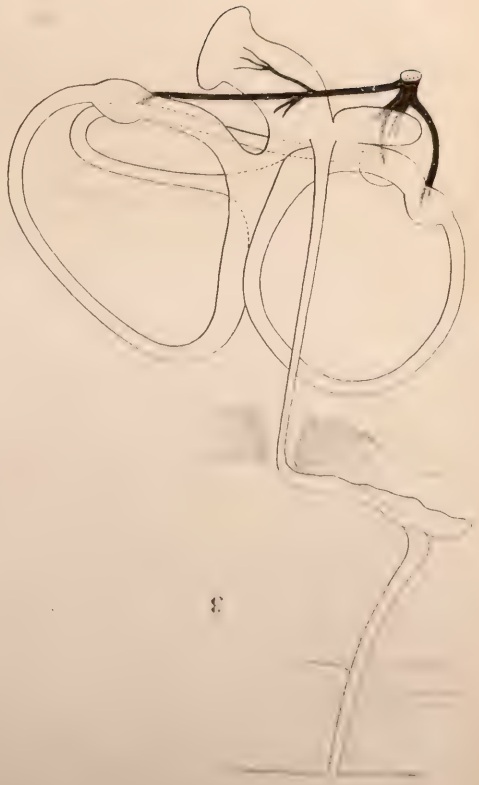


MEMBRANOUS LABYRINTHS OF SHARKS.

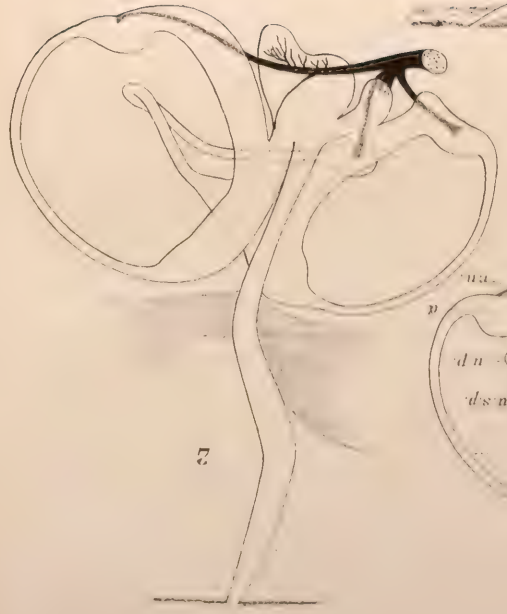
M. P. Parker lith.  
Parker & West imp.



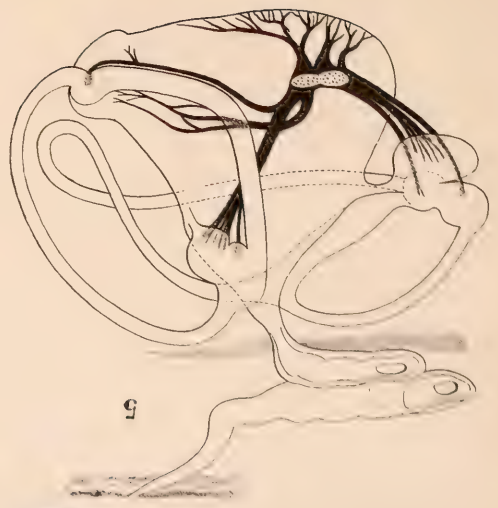
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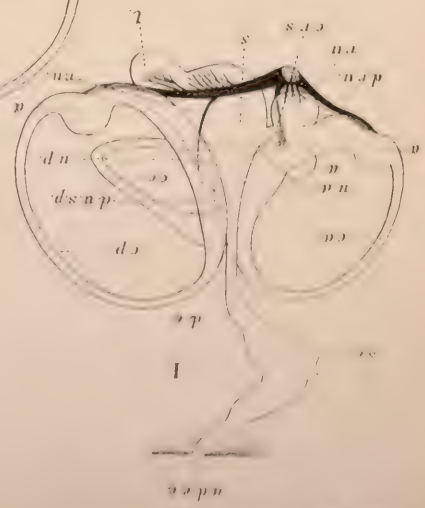
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1

of the utricles, which in this case still more closely resemble the Teleostean sinus superioris utriculi. The extra-cranial part of the ductus endolymphaticus appears to make the usual forward bend in close contact with the skull; it then seems to pass backwards for a short distance, is then directed forward again for a short distance in front of the first bend, passing again backwards, and finally ascending to its external opening. The sacculus and lagena resemble those of *Notidanus* and *Læmargus*.

CARCHARIAS LAMIA. Fam. Carchariidæ.

The very large size of the sacculus in this Shark results in the ductus endolymphaticus immediately after its origin passing through the skull; it there makes the usual bends, forwards and backwards, and finally upwards to its external opening. The recessus utriculi has similar communications with the utricule and sacculus as in *Notidanus* and *Læmargus*. The canalis utriculo-saccularis posterior is remarkably dilated into a rounded chamber shortly before its termination in the sacculus, and blending with it is a like dilatation of the utriculus. The ramulus neglectus is, as usual, given off by the nerve that supplies the ampulla of the posterior canal. It is of unusually large size; it sends a small twig to the dilatation on the utricule, but by far the larger portion is distributed to the macula on the dilatation of the posterior utriculo-sacculine canal.

EXPLANATION OF PLATE 40.

The right membranous labyrinths of five genera of Sharks, viewed from the mesial side; all except fig. 3 are of natural size, fig. 3  $\times$  2.

<i>a.</i> Ampullæ.	<i>d.r.u.</i> Ductus recessu utriculi.
<i>a.d.e.e.</i> Apertura ductus endolymphatici externa.	<i>l.</i> Lagena cochliæ.
<i>c.a.</i> Canalis anterior.	<i>r.n.</i> Ramulus neglectus.
<i>c.e.</i> Canalis externus.	<i>r.u.</i> Recessus utriculi.
<i>c.p.</i> Canalis posterior.	<i>s.</i> Sacculus.
<i>d.e.</i> Ductus endolymphaticus.	<i>s.e.</i> Saccus endolymphaticus.
<i>d.u.s.p.</i> Ductus utriculo-saccularis posterior.	<i>u.a.</i> Utriculus anterior.
	<i>u.p.</i> Utriculus posterior.

- Fig. 1. *Notidanus griseus*.  
 2. *Læmargus borealis*.  
 3. *Lamna cornubica*.  
 4. *Alopias vulpes*.  
 5. *Carcharias lamia*.